REMARKS

Applicant has reviewed and considered the Office Action mailed on October 16, 2007 and the references cited therein.

No claims have been amended, canceled, or added in the present response. As a result, claims 1-33 are still pending in this application.

35 USC § 103 Rejection of the Claims

Claims 1, 5-6, 8-10, 13, 26-30, and 33 were rejected under 35 USC § 103(a) as being unpatentable over *Okada et al.* (US Publication 2002/0003773) in view of *Wikipedia* (http://en.wikipedia.org/wiki/fading (Flat vs. Frequency-selective Fading)).

The Applicants respectfully traverse this rejection. It is assumed that the Examiner is relying upon the Wikipedia article under 35 USC § 102(a), which reads as follows:

> "A person shall be entitled to a patent unless —
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent," (Emphasis added).

The date of invention associated with a U.S. patent application, unless shown to be earlier by affidavit, is taken as the filing date of the application. The filing date of the present application is March 31, 2004. Therefore, to support a rejection under 35 USC § 103, the subject matter relied upon within the Wikipedia article would need to have a publication date that precedes March 31, 2004. It is submitted that this is not the case.

Wikipedia is a web-based, free content encyclopedia that allows users to add new articles and edit existing articles. Each article in Wikipedia includes a "history" page, accessed through a history tab, that keeps track of the changes made to the article over time. The history page typically shows the date that an article was originally added to Wikipedia as well as the dates that each edit was made to the article. Therefore, using the history page, the publication date of particular subject matter within an article can be determined by finding the date that the subject matter was first added to the article. In the above-described obviousness rejection, the Examiner relies upon a portion of the "fading" article in Wikipedia having a heading "Flat vs. Frequency-selective Fading." Reference to the history page of the "fading" article shows that there was no

mention of "flat fading" or "frequency selective fading" in the article before September 17, 2005, which is well after the filing date of the present application. A copy of the article as it existed on September 17, 2005 is attached as well as a copy of the immediately preceding version of the article from September 3, 2005. As shown, the September 17, 2005 version mentions "flat fading" and "frequency selective fading" and the earlier September 3, 2005 version does not. In addition to the above, in the obviousness rejection, the Examiner sets out a specific portion of text from the Wikipedia article that is being relied upon (i.e., the passage starting "In a frequency-selective fading channel ...."). Reference to the history page of the article shows that this language was not added to the article until July 24, 2007. Copies of the article from July 23, 2007 and July 24, 2007 are attached to show the addition of the referenced language.

Based on the foregoing, it is submitted that the "fading" article from Wikipedia is not proper prior art in the present application. As this article forms an integral part of the underlying rejection, it is submitted that the Examiner has failed to provide a prima facie case of unpatentability with regard to claims 1, 5-6, 8-10, 13, 26-30, 33. Reconsideration and allowance of these claims is therefore respectfully requested.

Claims 15-22 were rejected under 35 USC § 103(a) as being unpatentable over *Menon et al.* (US Patent 6,940,917) in view of *Wikipedia* (http://en.wikipedia.org/wiki/fading (Flat vs. Frequency-selective Fading)).

For the reasons set out above, the Wikipedia article cited by the Examiner is not proper prior art in this case. Therefore, it is submitted that a prima facie case of unpatentability has not been established with regard to claims 15-22. Reconsideration and allowance of these claims is therefore respectfully requested.

Claims 2-4 were rejected under 35 USC § 103(a) as being unpatentable over *Okada et al.* (US Publication 2002/0003773), *Wikipedia* (http://en.wikipedia.org/wiki/fading (Flat vs. Frequency-selective Fading)) and in view of *Li et al.* (US Patent 7,020,072).

For the reasons set out above, the Wikipedia article cited by the Examiner is not proper prior art in this case. Therefore, it is submitted that a prima facie case of unpatentability has not been established with regard to claims 2-4. Reconsideration and allowance of these claims is therefore respectfully requested.

Claims 11 and 31 were rejected under 35 USC § 103(a) as being unpatentable over *Okada et al.* (US Publication 2002/0003773), *Wikipedia* (http://en.wikipedia.org/wiki/fading (Flat vs. Frequency-selective Fading)) and in view of *Daudelin* (US Patent 4,716,376).

For the reasons set out above, the Wikipedia article cited by the Examiner is not proper prior art in this case. Therefore, it is submitted that a prima facie case of unpatentability has not been established with regard to claims 11 and 31. Reconsideration and allowance of these claims is therefore respectfully requested.

Claims 12 and 32 were rejected under 35 USC § 103(a) as being unpatentable over *Okada et al.* (US Publication 2002/0003773) in view of *Wikipedia* (Flat vs. Frequency-selective Fading) and further in view of *Kumagai et al.* (US Patent 5,796,307).

For the reasons set out above, the Wikipedia article cited by the Examiner is not proper prior art in this case. Therefore, it is submitted that a prima facie case of unpatentability has not been established with regard to claims 12 and 32. Reconsideration and allowance of these claims is therefore respectfully requested.

Allowable Subject Matter

Claims 7, 14, 23-25 were objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. As it is believed that the independent claims are in form for allowance, these claims have not been rewritten in the present response.

Please note that no part of the present response should be construed as an admission that the combinations of references relied upon by the Examiner in any of the above rejections would have rendered any of the claims of the present application obvious would the Wikipedia article have been valid prior art. Likewise, no part of the present response should be construed as an admission that the Wikipedia article teaches or suggests any of the elements of the claims of the present application. On the contrary, because the Wikipedia article is not proper prior art in the present application, no position is being taken as to the content of the reference. All relevant arguments from the previous response with regard to Okada et al. and any other cited reference are maintained herein.

Conclusion

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (480-948-3745) to facilitate prosecution of this application.

Respectfully submitted,

JOHN S. SADOWSKY ET AL.

By their Representatives,

CUSTOMER NUMBER: 45643
480-948-3745

Date: January 15, 2008

By John C. Scott
John C. Scott
Reg. No. 38,613

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop Amendment, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 15th day of January, 2008.

Shellie Bailey
Shellie Bailey

Fading

From Wikipedia, the free encyclopedia

This is an old revision of this page, as edited by Kgrr (Talk | contribs) at 14:57, 3 September 2005. It may differ significantly from the current revision.

(diff) ← Older revision | current version (diff) | Newer revision → (diff)

In telecommunications, **fading** is a change in the attenuation of a communications channel.

Examples of fading (in alphabetical order):

- Rayleigh fading
- Rician fading

The term "*backhoe fade*" is used humorously to describe the complete loss of signal that occurs in a communications cable when it is cut by a backhoe or other digging work. Backhoe fade is one of the most common causes of failure in subterranean cables.

The equivalent phenomenon in submarine cables occurs when a cable is snagged by a fishing net or anchor.

Techniques used to overcome signal fading:

- Diversity reception
- Diversity transmission
- MIMO

Fading (2001), is also the therapy written poetry book by singer/pianist Raven Oak. Filled with seven years of poetry, this book explores the depth and pain in surviving both rape and abuse. This book donates to RAINN, the Rape, Abuse, & Incest National Network. ISBN 0-9712833-0-3

Tatoos can be removed by **fading** them.

Fading Creams can be used to remove scars, age spots and stretch marks.

Also See

- Fade margin
- Fading distribution
- Link Budget
- Multipath

Fading

From Wikipedia, the free encyclopedia

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Also See

- Fade margin
- Fading distribution
- Link Budget
- Multipath

Small-scale fading is usually divided into fading based on multipath time delay spread and based on doppler spread.

There are two types of fading based on multipath time delay spread: **Flat Fading**: Where the bandwidth of the signal is less than the bandwidth of the channel and the Delay Spread is Less than the Symbol Period. **Frequency selective Fading** Where the bandwidth of the signal is greater than the Bandwidth of the Channel and the Delay Spread is greater than the Symbol Period.

There are two types of fading based on Doppler Spread: **Fast Fading**: Which has a high doppler spread, the coherence time is less than the symbol period, and channel the variations are faster than basedband signal variations. **Slow Fading**: Has a low doppler spread. The coherence time is greater than the symbol period and the channel variations are smaller than baseband signal variations.

Fading

From Wikipedia, the free encyclopedia

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This is about the phenomenon of loss of signal in telecommunications. For the book, see Fading (Book)

Fading refers to the distortion that a carrier-modulated telecommunication signal experiences over certain propagation media. A **fading channel** is a communication channel that experiences fading. In wireless systems, fading is due to multipath propagation and is sometimes referred to as **multipath induced fading**.

Selective fading causes a cloudy pattern to appear on an FFT display.

Contents

Key Concepts

Fading results from the superposition of transmitted signals that have experienced differences in attenuation, delay and phase shift while travelling from the source to the receiver. It may also be caused by attenuation of a single signal. The most common types of fading, known as "slow fading" and "fast fading", as they apply to a mobile radio environment, are explained below.

Beforehand, it might be necessary to remind ourselves of a definition of fading:

Fading refers to the time variation of the received signal power caused by changes in the transmission medium or path.

- **Slow Fading**: **Shadowing** or Large-Scale fading is a kind of fading caused by larger movements of a mobile or obstructions within the propagation environment. This is often modeled as log-normal distribution with a standard deviation according to the Log Distance Path Loss Model.

- **Fast Fading**: Multipath fading or Small-Scale fading is a kind of fading occurring with small movements of a mobile or obstacle.

For example, consider the common experience of stopping at traffic lights and hearing a lot of static on your FM broadcast radio, which is immediately corrected if you move less than a metre. Cellular phones also exhibit similar momentary fades. The reason for these losses of signal is the destructive interference that multiple reflected copies of the signal makes with itself. To understand how a signal can destructively interfere with itself, consider the sum of two sinusoidal waveforms (which are similar to modulated carrier signals) with different phases.

Fading channel models are often used to model electromagnetic transmission of information over wireless media such as with cellular phones, and in broadcast communications. Also, in underwater acoustic communications the notion of fading is useful in understanding the distortion caused by the medium. Mathematically, the simplest model for the fading phenomenon is multiplication of the signal waveform with a time-dependent coefficient which is often modeled as a random variable, making the received signal-to-noise ratio a random quantity.

Small-scale fading is usually divided into fading based on multipath time delay spread and that based on Doppler spread.

There are two types of fading based on multipath time delay spread:

- **Flat fading**, where the bandwidth of the signal is less than the coherence bandwidth of the channel or the delay spread is less than the symbol period.
- Frequency selective fading, where the bandwidth of the signal is greater than the coherence bandwidth of the channel or the delay spread is greater than the symbol period.

There are two types of fading based on doppler spread:

- **Fast fading**, which has a high doppler spread, and the coherence time is less than the symbol period, and the channel variations are faster than baseband signal variations.
- **Slow fading**, which has a low doppler spread. The coherence time is greater than the symbol period and the channel variations are slower than the baseband signal variations.

In addition to the small scale fading that is described above, for which the change in the signal strength occurs, for mobile phone frequencies, on the order of a fraction of a meter, the signal can also undergo shadow fading, or shadowing. This is due to the presence of obstacles between the transmitter and the receiver, and the scale of distance required to experience shadowing is about an order of magnitude larger than that of multipath fading. .

Examples of fading with reference to the distribution of the attenuation are:

- Nakagami fading
- Weibull fading
- Rayleigh fading
- Rician fading

Mitigation

Fundamentally, fading causes poor performance in traditional communication systems because the quality of the communications link depends on a single path or channel, and due to fading there is a

significant probability that the channel will experience a deep fade. The probability of experiencing a fade (and associated bit errors as the signal-to-noise ratio drops) on the channel becomes the limiting factor in the link's performance.

The effects of fading can be combated by using diversity to transmit the signal over multiple channels that experience independent fading and coherently combining them at the receiver. The probability of experiencing a fade in this composite channel is then proportional to the probability that all the component channels simultaneously experience a fade, a much more unlikely event.

Diversity can be achieved in time, frequency, or space. Common techniques used to overcome signal fading include:

- Diversity reception and transmission
- OFDM
- Rake receivers
- Space–time codes
- MIMO

See also

- Fade margin
- Fading distribution
- Link budget
- Multipath
- Backhoe fade
- Thermal Fade

Literature

- T.S. Rappaport, *Wireless Communications: Principles and practice*, Second Edition, Prentice Hall

External links

- Fading due to multipath effect

Fading

From Wikipedia, the free encyclopedia

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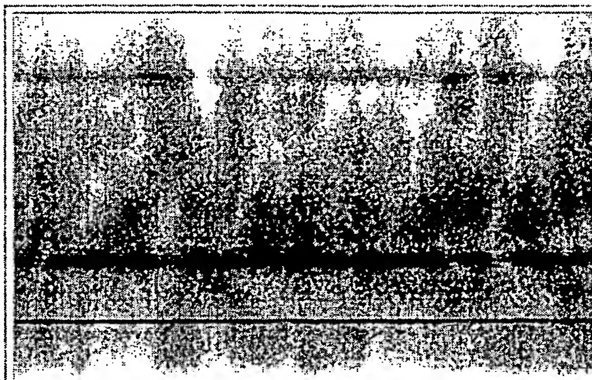

Selective fading causes a cloudy pattern to appear on an FFT display.

Contents

Key Concepts

In wireless communications, the presence of reflectors in the environment surrounding a transmitter and receiver create multiple paths that a transmitted signal can traverse. As a result, the receiver sees the superposition of multiple copies of the transmitted signal, each traversing a different path. Each signal copy will experienced differences in attenuation, delay and phase shift while travelling from the source to the receiver. This can result in either constructive or destructive interference, amplifying or attenuating the signal power seen at the receiver. Strong destructive interference is frequently referred to as a **deep fade** and may result in temporary failure of communication due to a severe drop in the channel signal-to-noise ratio.

A common example of multipath fading is the experience of stopping at a traffic light and hearing an FM broadcast degenerate into static, while the signal is re-acquired if the vehicle moves only a fraction of a meter. The loss of the broadcast is caused by the vehicle stopping at a point where the signal experienced severe destructive interference. Cellular phones can also exhibit similar momentary fades.

Fading channel models are often used to model the effects of electromagnetic transmission of information over the air in cellular networks and broadcast communication. Fading channel models are also used in underwater acoustic communications to model the distortion caused by the water. Mathematically, fading is usually modeled as a time-varying random change in the amplitude and phase of the transmitted signal.

Slow vs. Fast Fading

The terms *slow* and *fast* fading refer to the rate at which the magnitude and phase change imposed by the channel on the signal changes. The **coherence time** is a measure of the minimum time required for the magnitude change of the channel to become decorrelated from its previous value.

- **Slow fading** is when the coherence time of the channel is large relative to the delay constraint of the channel. In this regime, the amplitude and phase change imposed by the channel can be considered roughly constant over the period of use. Slow fading can be caused by events such as **shadowing**, where a large obstruction such as a hill or large building obscures the main signal path between the transmitter and the receiver. The amplitude change caused by shadowing is often modeled using a log-normal distribution with a standard deviation according to the Log Distance Path Loss Model.

- **Fast Fading** is when the coherence time of the channel is small relative to the delay constraint of the channel. In this regime, the amplitude and phase change imposed by the channel varies considerably over the period of use.

In a fast-fading channel, the transmitter may take advantage of the variations in the channel conditions using time diversity to help increase robustness of the communication to a temporary deep fade. Although a deep fade may temporarily erase some of the information transmitted, use of an error-correcting code coupled with successfully transmitted bits during other time instances can allow for the erased bits to be recovered. In a slow-fading channel, it is not possible to use time diversity because the transmitter sees only a single realization of the channel within its delay constraint. A deep fade therefore lasts the entire duration of transmission and cannot be mitigated using coding.

Flat Fading vs. Frequency-selective Fading

As the carrier frequency of a signal is varied, the magnitude of the change in amplitude will vary. The coherence bandwidth measures the minimum separation in frequency after which two signals will experience uncorrelated fading.

- In **flat fading**, the coherence bandwidth of the channel is larger than the bandwidth of the signal. Therefore, all frequency components of the signal will experience the same magnitude of fading.

- In **frequency-selective fading**, the coherence bandwidth of the channel is smaller than the bandwidth of the signal. Different frequency components of the signal therefore experience decorrelated fading.

In a frequency-selective fading channel, since different frequency components of the signal are affected independently, it is highly unlikely that all parts of the signal will be simultaneously affected by a deep

fade. Certain modulation schemes such as OFDM and CDMA are well-suited to employing frequency diversity to provide robustness to fading. (OFDM uses variable bit loading and coding across subcarriers to achieve this, while CDMA uses the Rake receiver.)

Fading Models

Examples of fading models for the distribution of the attenuation are:

- Nakagami fading
- Weibull fading
- Rayleigh fading
- Rician fading

Mitigation

Fundamentally, fading causes poor performance in traditional communication systems because the quality of the communications link depends on a single path or channel, and due to fading there is a significant probability that the channel will experience a deep fade. The probability of experiencing a fade (and associated bit errors as the signal-to-noise ratio drops) on the channel becomes the limiting factor in the link's performance.

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Categories: Wireless communications | Radio frequency propagation